

1884, we at last get the following remarkable statement:—"The bacilli are not quite rectilinear, like other bacilli, but slightly curved, like a comma. The curvature is sometimes sufficient to give the bacillus a semicircular form" (see woodcut, fig. F).

I think that it is abundantly clear that the organism selected by Dr. Koch in Egypt as the cause of cholera is not the same organism as that which he selected when in India, and that, although he is aware of that fact, he has not explicitly stated it, but has on the contrary (as does the writer in *NATURE*) endeavoured to give the impression that they are the same organism.

A further point of great importance as affecting the validity of Dr. Koch's theories, with regard to the connection of what he calls the comma-bacillus with cholera, is the statement of Dr. Lewis which is abundantly confirmed, and is not disputed by Koch, viz. that comma-bacilli, indistinguishable in appearance from those occurring in cholera cases, are quite common in the mouths of healthy persons. There is no doubt whatever that this is the case, although no record of the fact is to be found in any published treatise or paper on Bacteria, and that it was not commonly known to bacteriologists previously to Dr. Lewis's announcement of it in last September. The writer of the article in *NATURE* of December 4 hardly gives full effect to the importance of this point, since he cites Dr. Koch's reply to Dr. Lewis at the same time that he records Dr. Koch's earlier statements. Setting aside for the moment Dr. Koch's reply to Dr. Lewis, let us examine Dr. Koch's statements bearing on this subject, at the time when he announced his supposed discovery of the cause of cholera. He wrote from India that the organisms which he identified as the cause of cholera were of *peculiar* form, and "on account of its peculiar form, I have given to it the name of comma-bacillus." Throughout his subsequent writings, previous to the publication of Dr. Lewis's report by the Army Medical Department, Dr. Koch speaks of his cholera-organism as *the* comma-bacillus. He does not mention that any micro-organism similar to it in form is known to him. Had he been acquainted with one commonly occurring in the mouth, he would certainly have said, "The cholera comma is very like one occurring in the mouth, but differs in such and such ways." So far from this, he expressly says that no similar organism occurs in the human body, and states that he has failed to find an organism like the comma-bacillus in (amongst other places) the human mouth. No subsequent statement (after Lewis's publication) can affect the evidence which we have here that Dr. Koch was not acquainted with the "comma" which occurs in the human mouth.

After Dr. Lewis had shown that a "comma-bacillus" indistinguishable from Koch's "comma-bacillus" occurs in the healthy human mouth, and that accordingly—if we may suppose, from their identity of form and close association, that the two organisms are identical in every respect—the fundamental proposition of Koch as to the exclusive association of his comma-bacillus with cholera utterly breaks down, Dr. Koch replied as follows—(1) that the occurrence of a comma-bacillus in the mouth had long been familiar to bacteriologists (he did not say, it is to be noted, that it had long been familiar to him); and (2) that this comma-bacillus of the mouth will not grow upon neutralised cultivating-gelatin, whereas that from the intestine will, and that accordingly there is no ground for regarding them as identical species.

It seems to me in the highest degree improbable that Dr. Koch was acquainted with the mouth-comma when he published his conclusions as to the cause of cholera. If he was acquainted with it, it is undeniable that he committed a very grave fault in not drawing attention to it, and pointing out then and there the differences presented by cultures of the two commas. I have fairly conclusive evidence before me of the fact that Dr. Koch was not acquainted with the comma-bacillus of the mouth two years ago, when he published his large report and coloured plates on the tubercle-bacillus. In one of the drawings in that work he gives a delineation of the chief forms of micro-organisms occurring in the mouth, in order as he says to enable other observers to guard themselves against any confusion of the tubercle-bacillus with the micro-organisms which are normally present in sputa. *No comma-like organism is figured in that drawing or mentioned by Dr. Koch.*

As to the cultures of the "comma" from cholera intestines on the one hand, and from the healthy mouth on the other, differing in respect of their properties or their sensitiveness to conditions of alkalinity and neutrality, I venture to say that, *taking into consideration the whole history of the case, it is not*

sufficient for Dr. Koch to tell us in an abrupt way that such differences exist. There is no reason to accept as final and perfect Dr. Koch's account of the characters of the comma associated with cholera, and I should greatly prefer to have the comparison of the conditions of growth of the commas from these two sources made by some one who is not, as Dr. Koch must unfortunately be, so very seriously biased in one direction.

I think there is some reason to expect that we shall hear from Dr. Klein as to the result of his impartial experiments, now being carried on in Calcutta, that the comma which occurs in the healthy mouth behaves in precisely the same way under cultivation, and is in fact as in appearance the same organism as the comma which occurs in the intestines of cholera patients.

Lastly, I may record a protest against Dr. Koch's extraordinary term "comma-bacillus." I have already pointed out that Dr. Koch uses botanical terminology loosely. The word "bacillus" has been by common consent restricted to the description of such rod-like forms as Koch first associated with cholera as the result of his Egyptian work. To prefix the word "comma" to this, was perhaps a method of avoiding unpalatable explanations. At the same time it is utterly inconsistent with the sense of the words. What Koch calls "comma-bacilli" may for convenience be termed "commas." They are well known to botanists as the segments of a spirillum (see woodcut, fig. E), the result of the breaking up of a spirillum into little pieces, one corresponding to each turn of the spire. They have been clearly figured and their nature recognised by Zopf. The "commas" of the human mouth and intestine are undoubtedly related to a spirillum which is frequently found in association with them, and would not have caused any astonishment or been stigmatised as "peculiar" in form by an observer who had that adequate knowledge of the natural history of the Schizomycetes in general which Dr. Koch has in many ways shown that he does not possess.

E. RAY LANKESTER

[We desire merely to make one remark with regard to the foregoing letter. The article referred to was prepared at the request of the Editor with the view of putting before the scientific public a fair and complete statement of Dr. Koch's case. The writer of the article requests us to state that he did not, except in the last paragraph, give any views of his own, and holds himself perfectly neutral in the matter, his mind not being at all made up on the subject.—ED.]

On the Distribution of Honey-Glands in Pitchered Insectivorous Plants

THE four genera of pitched insectivorous plants at present in general cultivation are *Nepenthes*, *Sarracenia*, *Darlingtonia*, and *Cephalotus*. Attention was drawn to the minute structure and physiological action of the first three of these by Sir J. Hooker in his celebrated presidential address to the British Association in 1874, while the structure and morphology of the last was treated of by my master, Prof. Dickson (*Journal of Botany*, 1878, 1881). Both observers pointed out an *attractive surface* studded with honey-glands, which constituted the lid part, a *conducting surface*, either of an exceedingly smooth nature (*Nepenthes*), or beset with small downward-directed hairs (*Sarracenia*, *Darlingtonia*, *Cephalotus*), and in most cases a *glandular surface* (*Nepenthes*, *S. purpurea*, and *Cephalotus*), the secretion from which directly or indirectly assisted in digestion of animal products. In *Sarracenia* and *Darlingtonia* there was found in addition a *detentive surface*, covered with long deflected hairs.

A year ago Prof. Dickson further drew attention to a set of magnificent attractive glands along the free edge of the corrugated rim in *Nepenthes*, which he named "marginal glands."

My attention has recently been directed to all the genera, and I propose stating here the main results. A detailed account of the comparative results obtained by examination of the different species in the young and adult condition will shortly be presented to the Royal Society of Edinburgh.

Nepenthes.—Examining a pitcher of Veitch's beautiful hybrid, *N. Mastersiana*, I observed on its outer surface what seemed to be the small openings of honey-glands. When microscopically examined, they were found exactly to resemble those on the inner lid surface, except that the gland fossa was deeply hollowed out, and opened externally by a small orifice, while its inner surface was clothed to within a short distance of the orifice

by the gland tissue, very much as in sphaeriaceous fungi the cavity of the perithecium is lined by asci. But even in this they agreed with the lid glands noticed by Dickson in *N. laevis*, and termed by him "perithecioid." Careful study of the outer lid surface revealed a few similar glands. On comparison of the species and hybrids grown in the Royal Botanic Garden, Edinburgh, a like condition was found to occur in all. The presence of these on the outer pitcher surface of *N. ampullaria* is interesting, since in it the lid is rudimentary, directed back, and destitute of glands on its inner surface.

At Prof. Dickson's suggestion I then examined the expanded lamina, and was agreeably surprised to find that glands were scattered rather sparingly over its upper, but pretty abundantly over its under, surface, especially near its junction with the stem. The tendril intervening between the lamina and pitcher also possessed them, and in some cases they were of very large size. Passing to the stem, it was found that some species had them very sparingly, others in considerable number, but while resembling those on the leaf externally, they were sunk much deeper in the tissue of the cellular layer, and strikingly reminded one of a simple animal gland.

After a comparative study of the different species I was induced to look at the sepals, as our garden curator, Mr. Lindsay, had mentioned to me that a very copious secretion of nectar took place in flowering. A complete pavement of glands the same in size and appearance as those on the inner lid surface of the pitcher, was spread over the upper epidermis of each. In Hooker's elaborate monograph of the genus ("De Cand. Prod." vol. xvii.) these are mentioned, though their complete resemblance to the latter is not indicated. A few large "perithecioid" glands may also be seen on the lower epidermis, and in flowers of *N. bicalcarata* (for opportunity of examining which I am indebted to Mr. Courtauld of Braintree), these attain relatively a gigantic size.

We see, therefore, that in *Nepenthes*, with its dioecious flowers, the same structure, which by their secretion attract insects for aiding in fertilisation, also lure them to the pitcher, so that their dead bodies may help in the nutrition of the plant.

Sarracenia.—Mellichamp pointed out (*Gardener's Chronicle*, 1874) that honey-glands are present not only on the lid, but also on the external projecting wing of the pitcher. I find, however, that, as in the last genus, they are diffused over the whole outer surface, including the lid; further, that in some of the species (*S. variolaris* and *S. rubra*) there are external upward directed hairs, as in some of the *Nepenthes*. On the outer surface of the three bracteoles and of the sepals the glands are likewise numerous, and will undoubtedly be insect attractors for promoting cross-fertilisation.

Darlingtonia.—This genus agrees with the last, except that the glands are very simple, being one- or at most two-celled. I have not as yet examined the flower, though there can be little doubt but that in it a like condition will occur.

Cephalotus.—Prof. Dickson, in studying this genus, noticed glands not only on the lid and outer pitcher surface, but even on the ordinary foliage leaves. I therefore required to deal only with the flowers. Scattered among the "encapsulating" hairs on the peduncle, bracts, and six sepals, were many glands identical with those of the leaves, though rather smaller; but further, the peculiar glandular processes intervening between the stamens and carpels seem to be the same mounted on cellular outgrowths of the receptacle.

Nepenthes, *Sarracenia*, *Darlingtonia*, and *Cephalotus* are therefore found to agree fundamentally in their morphological arrangements for physiological purposes, though referable to orders widely separated systematically.

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Earthquakes in England, and their Study

As no record of the most recent earthquake shock in England has yet found a place in the pages of *NATURE*, perhaps I may be permitted to give the following slight details, collected from the daily papers of Lancashire and London for November 15:—

A shock of earthquake ("severe," yet causing no actual injury) was experienced at Clitheroe, and in the neighbourhood, on the evening of November 14. At about 5.10 p.m. a terrific report, resembling loud thunder, was heard, instantly followed by a strong vibration of the earth, sufficient to induce the inhabitants to run out of their houses into the streets in a terrified state.

At Low Moor, where the shock seems to have been felt most strongly, the wife of a man named Wilkinson fainted with fright. A waggoner on the road states that his two horses were nearly thrown to the ground. Much excitement prevailed throughout the borough and neighbourhood of Clitheroe, especially at Low Moor.

A lurid glare noticed in the sky at the time of the disturbance—5.10 p.m., sun set at 4.10—is mentioned in connection with the occurrence, but that appearance was, in all probability, only one of the sunset-glow effects with which we have lately become so familiar, and had nothing to do with the shock.

The circumstance that this particular part of Lancashire is much subject to earthquake disturbances, makes it specially important that no details of their occurrence be lost to science. Within the last fifty years at least six well-authenticated shocks have been recorded,—in 1835, 1843, 1868, 1871, 1873, and 1884,—and this list might easily be extended. Lancashire, indeed, may be considered as one of the chief areas of disturbance in England, and after Comrie, in Perthshire, perhaps the most important centre of seismic action in Great Britain.

While writing upon this subject, perhaps I may be allowed to offer the suggestion that, as the study of seismology is now one of such growing importance, it would be of considerable interest to many if a small space were set apart in the columns of *NATURE* every month, devoted specially to the record of current earthquake action, and kindred convulsions, in a scientific manner. It is my experience, as one who has for some time been engaged in collecting certain facts of these phenomena from various sources, that no sufficiently precise and complete records of the necessary facts, as may thus be readily transferred to the annals of exact science, are anywhere available. The general observations of seismic disturbance as heretofore described, are usually not only scanty in the matter of their detail, and often dressed up still with a superstitious flavouring, but also, for lack of the right class of observation, are too frequently merely vague and useless statements of wrong facts, generally in favour of doubtful hypotheses; and these are allowed to take the place of a well-ordered treatment of the real state of the case, upon a proper scientific basis.

WILLIAM WHITE

55, Highbury Hill, N., December 9

The Cacao-Bug of Ceylon

THE note by Mr. Distant in your number for October 30 (p. 684) may perhaps lead its readers to think that the insect which has lately been the subject of a report to the Ceylon Government has been wrongly identified by me as *Helopeltis antonii*, Sign. As that report will, however, before this have reached England, the matter will probably have been set right. I am not an entomologist, nor have I here the opportunity of reference to Signoret's original description or to other descriptive works; but the insect is, without any doubt at all, that which is well known—too well known—in Assam and in Java as *Helopeltis*. In the former country it is the destructive tea-bug or "mosquito-blight,"¹ and in the latter it is the notorious pest of the cinchona plantations.

As to the fragments which reached Mr. Distant, they were apparently insufficient for identification, further than with the family *Reduviidae*. The cacao-tree harbours a host of Hemiptera, and planters are very apt to confound the innocent with the guilty. Its only formidable enemy in this order of insects, however, so far as I have seen, is the *Helopeltis*.

HENRY TRIMEN

Royal Botanic Garden, Peradeniya, Ceylon,
November 21

The "Messenger of Mathematics"

I THINK it is right that attention should be publicly directed to the exceedingly irregular appearance of the *Messenger of Mathematics*. In the case of a magazine of its size and character there is no reason whatever why it should not be published on the first of each month. The "heavy" mathematical journals may be permitted to turn up when their editors please; but the case of a *monthly* meant to foster a taste for mathematical investigation among junior mathematicians is entirely different; indeed, the good such a magazine is calculated to do is almost nullified by irregular publication. The *Messenger* is always

¹ Since my report was written, Mr. Wood-Mason's short treatise on the tea-bug has reached us here.